

Land Report

Number 112, Summer 2015 · The Land Institute



About The Land Institute

MISSION STATEMENT

When people, land and community are as one, all three members prosper; when they relate not as members but as competing interests, all three are exploited. By consulting nature as the source and measure of that membership, The Land Institute seeks to develop an agriculture that will save soil from being lost or poisoned, while promoting a community life at once prosperous and enduring.

OUR WORK

Thousands of new perennial grain plants live year-round at The Land Institute, prototypes we developed in pursuit of a new agriculture that mimics natural ecosystems. Grown in polycultures, perennial crops require less fertilizer, herbicide and pesticide. Their root systems are massive. They manage water better, exchange nutrients more efficiently and hold soil against the erosion of water and wind. This strengthens the plants' resilience to weather extremes, and restores the soil's capacity to hold carbon. Our aim is to make conservation a consequence, not a casualty, of agricultural production.

LAND REPORT

Land Report is published three times a year. ISSN 1093-1171. The editor is Scott Bontz. To use material from the magazine, reach him at bontz@landinstitute.org, or the address or phone number below.

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Rachel Mallinger studies diversity and behavior of bees in silphium, a plant being developed as an oilseed crop at The Land Institute. Bees might be introduced for pollination. For more, see page 16. Scott Bontz photo.



Chris Brown teaches environmental studies, and wondered what about that name doesn't fit the ideas discussed at a Land Institute conference for ecospheric studies. Land Institute President Wes Jackson championed the new name for exactitude and getting people to see Earth as a system of which they are a dependent part, instead of only as an environment outside of themselves. Scott Seirer photo.

Paradigm Shift U.

Talk of an education and worldview called ecospheric, in results if not in name

Imagine that you are watching a university news conference. Perhaps it is in your hometown. With the trustees standing nearby, the school's president makes this announcement:

“Would you send your children to a university that still taught that Earth was at the center of the solar system, and that the heavens are a separate sphere from Earth? Kepler and Copernicus shattered those views centuries ago, in a revolution that transformed nearly every facet of life in European history, including the university curriculum. Today universities teach students similarly false and increasingly dangerous views about the planet: its resources are there only for our use; those resources can sustain infinite economic growth; to solve problems along the way we need only greater efficiency. This teaching happens even though, from the work of 19th century ecologists and biologists to work now in biomimicry, industrial ecology, and what The Land Institute calls natural systems agriculture, there has emerged an understanding of Earth as a cloth spectacularly complex, but woven to work as a finite whole. For example, we can see that something like cutting Brazilian rainforest does not just cost us native plants, animals, and soil, it upsets the world's hydrology. It is time for higher education to reflect this new worldview of Earth as *ecosphere* – the house of the

globe – in its curriculum and mission. As of today we are putting this paradigm shift on a fast track. The university will begin a 10-year process to transform our educational mission, values, and goals to better reflect the ecosystem model of the human-natural world. We will still produce world-class research and highly sought-after graduates. We will still offer all of our traditional degree programs. But we will work tirelessly to find ways to bring the insights of the emerging ecospheric worldview to the entire university community, and to the world. Change is never easy; radical change is always resisted. But this is a change too long in coming, as statistics continue to show. We need better solutions to our energy and food system problems. We need to find ways for 8 billion people to live on the planet without a fourth of them living miserable lives. At this school we want to lead higher education in rejecting half-measures and curricular tinkering that increasingly make matters worse. To do otherwise is to give our young people worse than a second-rate education. It is to prepare them to live in and understand a world that no longer exists.”

This scene helped preface a two-day conference in June at The Land Institute. Participants did in fact talk about how to develop ecospheric studies, and to change the dominant worldview, from one of treating Earth as a mine and the economy as a

separate machine, to one of people working as an interdependent part of the planetary whole. The Land Institute studies how to farm more like a complex, natural ecosystem, such as prairie, growing perennial grains in mixtures of species. It has done this with a broader idea about humanity's fit and role, using a mission statement that opens, "When people, land, and community are as one, all three members prosper; when they relate not as members but as competing interests, all three are exploited." Now it has begun work toward an ecospheric worldview in other institutions, to make this the new paradigm, the standard.

"We want people to think differently about how the world is," said Bill Vitek, a philosophy professor at Clarkson University, in upstate New York, who helped organize the conference. At separate moments in the meeting, his cohort, Land Institute President Wes Jackson said, "We're talking about rearrangement of a neural network. We've got to overturn an awful lot of fundamental thinking. How do we get rid of some of these nutty ideas?" He referred to belief in capacity for the economy's eternal growth. Humans colonize but don't really understand the world, he said: "We just don't know our place in it."

He wants the ecospheric view's *institutionalization*. This has too many syllables, he said, but no other word will do. John Linstrom, a doctoral student in English at New York University, said he liked it more than "organizing" because it's unsettling. Going with Jackson's argument not to accept a thinking shift smaller than worldwide, Valentin Picasso, a former Land Institute graduate school fellow from Uruguay who recently took a position at the University of Wisconsin, drew laughs by saying, "I don't like the in of institutionalization. I'd rather have an extitutionalization."

The three dozen people who attended the conference did not dwell on finding a better word than institutionalization. But most were academics, and they spent time on the meaning of ecospheric studies, and whether the phrase is needed, instead of ecology or environmental studies.

Jackson was the main proponent of the new phrasing, for its exactness and distinctness. "Changing of the precision of our language has potential for changing the flow of information in our brains," he said. He wants to eliminate the word "environment" from discussion, because it means something around and apart from us, a false dualism. Citing botanist and ecologist J. Stan Rowe, he argued that even the word "biosphere" has a bias, toward the biological, "which lets us play fast and loose with the physical." He meant things distinct from organisms, such as minerals, though the same things help make the organism.

Citing Rowe again, Jackson worked his way up through a hierarchy of biological distinctions: molecule, cell, organ, organism, ecosystem. Each has "contiguous volume." Each also becomes something greater than its parts, the cell, for example, as a metabolizing, reproducing system, not just as interacting molecules; the organism more than a mass of cells. Each has "emergent properties."

Above ecosystem Jackson sees the ecosphere. It is more than just the biggest ecosystem, a superorganism, he said. It's a supraorganism, something different, with emergent properties such as global climate. It came before ecosystems in time and in place, and it creates and sustains all of them. Jackson said it is really the only truly creative thing. (He recognized powers outside the sphere – the sun, and even Jupiter's pull – as constants.) There's nothing wrong with loving organisms and species and even

ecosystems, he said, as long as we don't dismiss the larger, sustaining whole. Here is some of the exchange that followed.

From John Hausdoerffer, professor of environmental sustainability and philosophy at Western State Colorado University: Is ecospheric studies different than environmental studies? How would this not just be a new label for my campus to laugh at?

From Chris Brown, director of environmental studies at University of Kansas: If we're already teaching some of these things, what are we doing wrong? Why does this not qualify as ecosystem studies?

From Tim Crews, The Land Institute's research director: Environmental economics is more about trying to address environmental issues in the growth economy. Ecological



Ken Levy-Church, a historian, philanthropist, and Land Institute board member, argued that teaching of an ecospheric worldview should not begin in college, but as early as preschool. Scott Seirer photo.

economics tries to think about the human economy within natural ecological constraints. Ecospheric is a better term for what environmental studies has been leading up to. The penalty is that few yet recognize the term. It might be seen as merely groovy. But it could differentiate the perspective from a sea of other environmental studies. The

Ecological Society of America now has an online science journal called Ecosphere.

From Craig Holdrege, director of The Nature Institute in Ghent, New York: We don't have to worry as much about the name as about the work. But the name would stretch the concept and make for an interesting research course. We should try to



Loretta Pickerell, right, of Oregon Department of Environmental Quality, said people have been taught to think about ecosystems, but not about the ecosphere. Rachel Stroer, left, managed the ecosphere discussion, which drew people from around the nation. Many had never met. Stroer closed with, “Those of you who didn’t know each other now do.” This must have meant something for advancing an idea, because they applauded. Scott Bontz photo.

understand Rowe's claim that the ecosphere is alive, but not an organism.

Jackson: Part of our struggle is to overcome common sense. The name helps do that. The idea of an ecosystem as a mere container, like a political boundary, has to be overcome. How do we overcome the problem of reassertion, of current ideas regaining their hold? This kind of term forces explanation of a difference. Then there is less risk of reassertion. Look at plowing of the Amazon rainforest after advocacy for its protection as mere ecosystem, a container.

Brown: But people study this already.

Jackson: Not recognizing emergent properties.

Brown: We're clearly not going to settle this here. I want to read more. There is disconnect between the things we already do and arguing about whether an ecosystem is a container or not.

Holdrege: How do I experience that the ecosphere is not a container? How do I show a student?

To perhaps partly answer that, from the conference preface, here are possible courses in ecospheric studies:

Carbon Pools Through History. The discovery and exploitation of the five carbon pools: soil, forest, coal, natural gas, and oil. Energy and its influence on the development and collapse of societies.

Sustainability Theory and Practice: History of the sustainability movement within the American environmental movement. Critical review of the movement's principles: efficiency, technological optimism, and maintenance of the status quo.

The Agrarians: From Thomas Jefferson to Wendell Berry.

Modernism and its Discontents: Francis Bacon, Rene Descartes, Galileo, and others who created our modern way of life,

from science and technology to economics and politics.

Fundamentals of Ecosystems Science.

Environment Philosophy and the Emergence of the Ecosphere: The philosophical contributions of thinkers including Ralph Waldo Emerson, Henry Thoreau, John Muir, Aldo Leopold, and Stan Rowe.

The Perennial Analogs: Ecospheric models being developed outside of perennials for agriculture, including biomimicry, industrial ecology, information theory, and ecological economics.

Fundamentals of the Sunshine Farm: The Land Institute's 10-year comparison of the energy going in and out of a conventional farm and of one that relies on contemporary sunlight.

Confronting the Demons of Ecological Pride: The sustainability movement is filled with well-meaning people who want change, but not too much of it, and who pride themselves on their ecological choices. This course asks the hard questions about how much change is necessary.

Vitek and Jackson said an ecospheric curriculum would need to shun half-measures, and remake the basis of education. "It would be akin to the rejection of Aristotelian science in the world's great universities during the Middle Ages," they wrote. These kinds of changes are disruptive, dangerous, and can get their architects killed. But Vitek said cultures are capable of remaking their "primary operating assumptions," and for other examples he gave the rise of monotheism, Greek and Roman humanism, and humanism's continuance in the Enlightenment. "Each new system unleashes a new way of being," he said. Vitek already sees evidence of ecospheric approach, even if not explicit: community supported agriculture, intentional communities, and thou-

sands of experiments in plain living. Four centuries ago Descartes and the other modernists helped launch a view that, in seeing the world as machinelike, and humans as self-interested, has made a great many humans very successful. But Vitek said, "We are living in a living universe, one constantly creating." The philosopher pressed that this was not just a concept, a way of description, but real. For a parallel he offered the recent recognition that our bodies are actually ecosystems, in which bacteria outnumber our cells 10-to-1. To leave ecosphere as only a conceptual container is to leave it open to injury for exploitation of its parts. Vitek asked if treating slavery as a conceptual tool would lead to its abolition. "Claims about what is real change the game," he said. For current example of resistance to getting beyond concept, he pointed to climate change skeptics.

Ken Levy-Church, a historian and Land Institute board member, said that an ecospheric worldview should not hit college freshmen as new, it should come in pre-school, summer camps, and grades K-12. "I think we have to work from the early stage on," he said.

But only one of the educators at the conference taught children, and how the studies would work in higher education, including the land grant university agricultural extension services, is where the discussion stayed.

Strategy alternatives were to invade existing universities, found affiliates and influence the establishment laterally, create entirely new schools, and work outside brick-and-mortar, with students building their own education, online and hands-on. Ken Renaud, who teaches architecture and environmental design at University of Colorado, said students are already halfway

to the last route, needing professors less, and fearing debt like the \$150,000 that he wracked up. They don't want to come to campus, he said, "They want to go do the things." He predicted that in five to 10 years, employers would not care about degrees, but about what applicants can build.

Mary Berry took the route of affiliation. Her mind had stuck with what Jackson said a decade and half ago about today's college majors being in upward mobility. He said the need is for a major in homecoming – of understanding and caring for your home place. (Gerald Gillespie, who teaches psychology at Kansas Wesleyan University, said education should address "a beautiful downward mobility.") Berry is daughter of agrarian writer Wendell Berry, and she wanted to educate and encourage young people for staying on or returning to farms. Kentucky's land grant school told her it no longer graduated "farmers." "I want to graduate farmers, and I want to get hold of what's left of a culture," she said.

The Berry Center, of which she is executive director, works toward this with St. Catharine College, a Catholic school of the Dominican order with about 600 students and 40 instructors in central Kentucky. Degrees are offered in farming and ecological agrarianism, one a bachelor's of science, the other a bachelor's of art, with science and culture elements shared. "The word 'culture' is imbedded in 'agriculture'," though this is often forgotten, said Leah Bayens, the three-year-old program's coordinator at St. Catharine. Bayens has a doctorate in English, and was chosen to keep the study interdisciplinary. It includes cornerstone classes in agrarian history and the measure of nature in literature.

Also required is the business of sustainable agriculture. A professor takes students over market hurdles, and how to

farm efficiently. Farming is hard to start. Few children of farmers follow them. St. Catharine works for economic and social encouragement for the would-be farmers, such as wholesale outlets to public schools.

There have been about 20 students, including some from The Congo and India. The first will graduate in December. Their degree will not be called ecospheric studies or homecoming, but Bayens said those things are part of the idea: using nature as a measure, achieving ecological literacy, making one's self part of a whole. "I think a major in homecoming is a paradigm-changing concept," she said.

What would ecospheric studies get for students and their societies? Conference-goers thought about this too. Here are some of the ideas.

Ryan Anderson, an ecological economist with the Delta Institute in Chicago, warned that environmental studies graduates are such generalists that they can't get jobs with his business. But he suggested, from Wendell Berry, this general skill: "The ability to solve for pattern."

Randy Schwering, who teaches management at Rockhurst University in Kansas City, Missouri, suggested a workshop instead of a college degree, and including in it how to negotiate and lead.

Linstrom, who learned about the formation of capitalism from English classes, thought students should leave ecospheric studies understanding the histories of ecology, economics, philosophy, literature, and science.

Aubrey Krug, a doctoral student in English at University of Nebraska, included these goals from one of the conference's work groups: Ask what it means to be a human citizen of the ecosphere, and how other cultures have answered this ques-

tion. Understand patterns and systems. Recognize your own ignorance. Learn ecology, economics, and ethics, and about empire, the erotic, and beauty.

From another group, Vitek gave these aims: More farmers. More solutions with unlikely partners. Understanding the link of local and global power. Skills to build livelihood, not just get a job. Understanding that we are "placelings," place-based beings, which entails physical work, social justice, and unlearning and relearning to imagine a new human niche.

Katherine Jenkins, who teaches ninth-graders in Baltimore, said her group thought students should learn to be a jack of all trades, master of one. They should develop a sense of resilience, and the abilities to learn from failure and deal with ambiguity. Feel capable of change. Feel affection for local place. Self-reflect. See one's self historically. Think scientifically, and about how things relate. Use ritual. Spend time outdoors. Learns species and rock forms. Spend time in community.

Holdrege, who reads Johann Wolfgang von Goethe in the original German, said the writer and scientist saw that nothing happens in isolation from the whole, and, even before the rise of evolutionary theory, that the organic world was one of "ceaseless creativity." We need to revolve around the phenomena, not the phenomena around us. In Goethe's words: "We must follow nature's example and become as mobile and malleable as nature herself."

Jenkins's husband, McKay Jenkins, who teaches journalism and environmental humanities at University of Delaware, said students are depressed and anxious about the world, and ready for change. "There's got to be some way to uncork this," he said. "You think they're apathetic, but they're really just waiting for the moment."



Captain Kirk and Mr. Spock get their first look at grain that would change a world. Use of photo and dialogue element from “Star Trek” courtesy of CBS Television Studios.

Logically, a perennial

In the 1967 “Star Trek” episode “The Trouble with Tribbles,” a space station surprises the starship Enterprise with a call to guard tons of grain bound for the politically contested Sherman’s Planet. Captain Kirk, considering guard duty beneath his crew, takes a sample packet offered by the station manager, Mr. Lurry, pours out the grain, and says, “Wheat. So what?”

Though Kirk continues through the episode to call it wheat, Nilz Baris, the agriculture department bureaucrat who has summoned him, says, “Quadrotriticale is not wheat, captain.” He condescendingly begins to explain. Kirk’s first officer, Mr. Spock cuts in: “Quadrotriticale is a high-yield grain. A four-lobed hybrid of wheat and rye. A perennial also, if I’m not mistaken. Its root grain, triticale, can trace its ancestry all the way back to 20th century Canada.” Mr. Lurry adds, “Quadrotriticale is the only Earth grain that will grow on Sherman’s Planet.”

Surely Mr. Spock is not mistaken. For perennial grains will go where no annual grains have gone before. They will not necessarily go boldly, in the sense of depending on annual soil disturbance. But they will wield superior ecological finesse. They will

better hold vulnerable soil in place, and more efficiently cycle soil nutrients.

If quadrotriticale is a perennial, something else must be true: it is not just a hybrid of annual wheat and annual rye, which in the 20th century were indeed crossed to make triticale. It must also have acquired genes for perenniality, perhaps from something like the hybrids being developed at The Land Institute.

“Tribbles” was science fiction writer David Gerrold’s first professional success. Through BenBella Books, publisher of novels such as his recent “Deathbeast,” he said, “I read an article about triticale, thought it would be interesting to use it instead of ordinary wheat. [Producer] Gene L. Coon said that this is the 23rd century, so it should be a futuristic grain – like “quadro-triticale.” So I called it a four-lobed hybrid, and that was that.” In 1967, he did not have in mind a scientific or ecological rationale for calling it a perennial.

Still, the word came forth, shortly before Wes Jackson’s first book, “Man and the Environment.” And perennial roots fit the scene Gerrold created. They bring the blessing sometimes offered by Mr. Spock – himself a hybrid, half human and half Vulcan: “Live long and prosper.”



Marty Christians and paper bags bring together for cross-pollination intermediate wheatgrass plants with desirable traits. One trait to make wheatgrass a better crop plant would be a shorter stem, so more energy from the leaves and roots can go to producing grain. Scott Bontz photo.

Nearer the short answer

A genetic discovery might lead to diverting energy from stem to grain

Usually it takes one intermediate wheatgrass plant to pollinate another. For two years Land Institute scientist Lee DeHaan has succeeded in getting individuals to fertilize themselves, as do most crop plants. DeHaan is domesticating wheatgrass to become one of the first perennial grain crops. His plants are not far from the wild, and so are much more genetically diverse than a typical crop variety. But their cross-pollination has allowed dominant alleles – one prospect of a gene – to mask recessive ones. Possibilities lie in the genome, but the plant's actual growth does not show them. Inbreeding through self-pollination will pair recessive alleles and reveal these once masked traits. Most of them will be bad, even fatal. So DeHaan can more quickly comb the wheatgrass genome for what he wants and doesn't want.

He might find something that would be bad in the wild but good for a crop. For example, look at height. Wild plants grow tall to compete for sunlight. Wheat plants once were taller. They made more stem for animal bedding, at the cost of food for people. They also blew over. Twentieth-century breeding boosted food supply by taking wheat down in height by a third to a half.

Among things that DeHaan saw after two years of success with self-pollinated wheatgrass is shorter plants. He initially could not tell if this resulted from a par-

ticular gene or was part of a general demise that comes with inbreeding. With the help of Traci Kantarski, however, he might be on to a useful gene for dwarfing. Kantarski pursued her doctorate at the University of Chicago by mapping areas of the wheatgrass chromosomes. To do so she made repeated visits to The Land Institute. In DeHaan's self-pollinating population she was able to associate a particular stretch of DNA with the short stature.

This does not mean a gene was found, but only that a signature area of one chromosome matched short stature in the plant. This area corresponds with one for dwarfing in barley. Dwarfing in barley, and in some wheat, results from one gene. DeHaan does not know that yet about wheatgrass. He expects to see short offspring from additional plants that self-pollinate, but might find the stature linked to other chromosome areas, and so from different genes. Without that fuller knowledge, he does not yet select and breed for dwarfing. But he is encouraged.

Kantarski completed her doctorate, and continues her work with wheatgrass at Kansas State University. She will sequence parts of the plant's genome, meaning not just find locations on chromosomes, but determine arrangement of molecules that make the DNA – the letters of the code. This will further speed selection of traits for a perennial to feed people. It will also benefit the soil, as it supplants soil-losing annual crops.

Land Institute shorts

Herbivores and pollinators

Insects are crucial for success with some crops, and insect pests can devastate them. Two scientists from annual crop sunflower country, North Dakota, studied both angles in July at The Land Institute, but for a perennial relative that is being domesticated.

Jarrad Prasifka, of the USDA Agricultural Research Service in Fargo, helps reduce pest damage. In Land Institute silphium plants he found common pests, a few not so common, and lots of damage, possibly building on a wet May. If The Land Institute won't use synthetic pesticides, it can use cultural countermeasures. Silphium researcher David Van Tassel's mowing after harvest time might explain why a wasp whose golf ball-size galls can infest 60 percent of plants in a prairie, ending the possibility of a flower on every stem they touch, here affects less than 1 percent. Prasifka will study samples he took back to Fargo and might have suggestion for Van Tassel to circumvent other pests. But silphium would be a new crop plant, and this is only the beginning of such study.

Rachel Mallinger works from Fargo to learn which traits make sunflowers attractive to pollinators, and whether the sunflower leafcutter bee might be enlisted like another bee in its genus used for pollinating alfalfa. Reliance solely on the honeybee, whose population recently has suffered, leaves growers vulnerable. At The Land Institute, Mallinger studied how dependent silphium is on insect pollinators, and the diversity and behavior of its bees – whether

they go from flower to flower on one plant, which does not help those that accept pollen only from another, or jump more among plants. Attracting and supporting pollinators is important for seed set in both sunflower and silphium, and for healthy insect populations for the whole farm.

Wheat scientist joins staff



Kathryn Turner began a two-year job to help decipher the molecular genetics of perennial wheat. At the University of Minnesota this year Turner finished her

doctoral study of wheat resistance to rust, a fungus. Her study here will be of which chromosomes – and perhaps some crucial genes – are retained and lost through crossing annual durum wheat with wheatgrass to make perennial wheat. Ten years ago Turner served as one of The Land Institute's summer workers. She grew up in Oklahoma City.

Press and presentations

Yale University's online magazine Environment 360, at e360.yale.edu, featured a story about progress toward perennial rice in China, and included from The Land Institute's Tim Crews general information about development of perennial grains. Staff members gave presentations in Illinois,

New York, Florida, Sweden, and Colorado. Scheduled appearances are September 15 in Elon, North Carolina, and October 24 in Topeka, Kansas.

New York foodies taste Kernza

At New York University, Land Institute scientist Lee DeHaan presented his development of intermediate wheatgrass to faculty, students, writers, and chefs gathered as The Experimental Cuisine Collective. DeHaan also met with a New York baker interested

in trying Kernza®, The Land Institute's name for food from its wheatgrass. Supply is not high, but The Land Institute plans to again sell small bags of Kernza at the Prairie Festival, September 25-27.

The University of Minnesota will conduct a new round of Kernza food science research. An early study looked at milling and baking. The new one will examine other keys to commercialization, such shelf life.

A test found that the dough-forming quality of some wheatgrass plants was near that of wheat. It was correlated with proteins that can be easily measured.



Sheila Cox sorts by weight silphium seed to be grown in Wisconsin by Organic Valley. The dairy co-op is interested in the seed oil for fueling farm equipment, and is selecting from plants that thrive in its cooler, wetter home of the upper Midwest. Scott Bontz photo.



Peter Kenmore, then with the UN Food and Agriculture Organization, and his wife, anthropologist Zenaida Kenmore, center, with extension agents and farmers near Hyderabad, India, in 2012. Kenmore retired last fall, but still serves as a representative, and says time is ripe for the FAO and governments to aid the world's small farmers.

A time to plant letters

A man who worked years with Asian rice farmers argues for helpful US policy

SCOTT BONTZ

For more than three decades Peter Kenmore taught and learned about insects and agriculture by wading through rice paddies and political systems from eastern Asia to South America. To consult rice farmers the American was on the road over 200 days a year. First he worked for the International Rice Research Institute in the Philippines, and then, based mostly in Southeast Asia, for the Food and Agriculture Organization of the United Nations.

Most of the Asian rice farmers he visited work plots a small fraction of the size of a US farmer's grain field. These farmers also have just a fraction of the money and political power of US agriculture corporations, which not only push farm policy at home, but also steer it abroad. Kenmore said this includes setting standards that make poorer farmers bear costs for the convenience of American companies and consumers, without supporting the complementary chance for them to build skills they could use to benefit their farm management, incomes, and families.

He perceives recent advances for these small farmers, but said there remain policies regarding pesticides, subsidies, and management that the United States should be supporting and is not. Though doing so might not immediately benefit agribusiness and supermarket shoppers, Kenmore said that it would pay in the long term for the world,

because farm families that enjoy security and good nutrition from better cropping and soil management make better, more participatory citizens, less susceptible to violence and fundamentalism. An estimated 40 percent of children in India are stunted, meaning not just physically small, he said, but without enough neurons to learn well in school.

Kenmore will argue at The Land Institute's Prairie Festival September 25-27 that potential for change in this arena through international organizations like the FAO, though slow for decades, is finally afire. He believes that now is the time you really should write your representative, to pressure the Agriculture and State departments. "Stuff's happening," he said.

He pointed to Pope Francis's recent encyclical on climate change and other costs of relentless economic growth. "I think that's a tremendous boost," he said. Kenmore perceived it as already driving presidential candidates Marco Rubio and Jeb Bush to soften their climate change language.

Kenmore is not a climate scientist. After studying evolutionary ecology at Harvard, biological pest control at Berkeley, and his fieldwork, he knows insects and agricultural ecology. But climate change is ecological, and it is political, and Kenmore also served as a high FAO administrator in Rome.

In conversation he speeds over wide ground, exuding the energy that could carry him through developing countries for most

“**B**ook learning is good. But the real thing is to get out and study.”

Peter Kenmore

of a year, engaging both government bureaucrats and hundreds of farmers, the latter in “field schools” where he joined local officials and answered questions only with other questions, helping farmers to be scientists, which makes them better farmers. He also helped them learn to use a broad palette of techniques to control pests, including conservation of predator insects, instead of just with insecticides, killing all insects, only to see the pests rebound worse than before.

Two years ago the FAO called a meeting in Rome to discuss development of perennial grains. Land Institute scientists presented their work. Last fall the researchers from Kansas talked strategy in Estes Park, Colorado, with more researchers from around the world, including the FAO’s Caterina Batello.

When The Land Institute began in earnest its development of perennial grains over 15 years ago, the FAO would not have paid attention to these kinds of meetings, Kenmore said. At that time the bureaucracy had amassed 200 stated objectives, suffocating discussion. It whittled the goals to 15, but this was still too much. Under a new director-general, Jose Graziano da Silva, the FAO now has a handful of broad, strategic aims: ending hunger, malnutrition, and rural poverty, and attaining agricultural sustainability through resilient communities and more transparent international trade. Helping is that Graziano da Silva is from Latin America, where talk about sustainable agriculture is more advanced. “FAO has real-

ly moved its center of gravity so we can have these conversations,” Kenmore said. In early September, the FAO, The Land Institute, and other researchers will meet again, this time with field school educators, in Mali.

Western money and clout helped developing countries before, in the Green Revolution that began in the middle of the 20th century and dramatically raised crop yields. Millions more were fed. But the revolution also stuck farmers with costly fertilizer and pesticides. Kenmore worked with governments and sees himself as part of that revolution. But he said “integrated pest management” cut pesticide use while seeing rice yields still rise. “We worked on taking the poison out of the fangs,” he said.

The avenue for this kind of management, the field schools, he called using knowledge instead of chemicals. In a long interview presented on the web site Annenberg Learner, he told how the schools start early in the day, because near the equator, later is stunningly hot. Groups of farmers count plant and insect types, and how many of each insect type. Through the season they watch the plants grow, the pest populations grow, the predators grow, the pests decline. They might graph the changes. They might cage plants, put in insect combinations, and observe what happens.

“Book learning is good,” Kenmore said. “But the real thing is to get out and study.”

In the Annenberg interview he said, “The discovery moment that we hear about from farmers most frequently is understanding that there are at least two kinds of bugs

in the field. There are bugs that eat plants. And there are bugs that eat bugs. That paradigm doesn't exist before the field school. For anywhere from 10 to 40 years both corporate and government communication campaigns have been telling them all bugs are bad. Spray all bugs and kill all bugs. When they begin to wrestle with the idea that there are two kinds of bugs, that there are good bugs and bad bugs, that there are bugs that are defending the rice, as well as bugs that are attacking it – that's the discovery for them that they come back to again and again."

Ninety countries with field schools have helped 12 million farmers, 10 times the number of farmers in US, Kenmore said. That is a small fraction of the roughly half-billion farmers in the world, and he argued for the need of a couple of hundred million gaining access to the training and its "participatory research."

For the past four to five millennia, rice has fed more *Homo sapiens* than has any other plant, and over the past 10,000 years, historian Hugh Thomas says, the job that humans have worked more than any other has been rice farmer. (Tim Crews, Land Institute research director, say the actual work that has taken most of our time, though moderns without gardens might have trouble imagining it, is weeding.) Kenmore liked working with farmers because they manage more ecosystems than any other people. He found their questions and observations interesting, and he liked thinking about food production ecologically. Rice is of great political importance, and Kenmore likes to think about that too.

Last November he retired, and, after more than three decades away, returned to live in the United States, just south of San Francisco in Daly City. He writes papers

with academics, and still consults for the FAO. Recently he helped with an insect called the yellow spined bamboo locust, which is hitting upland rice farmers in Laos.

His wife, Zenaïda, is an anthropologist from the Philippines, and one of their three children settled in Daly City. "I like living in an Asian town," Kenmore said. "Daly City is a very Asian place." After decades in the steaming south, he's not yet adapted to the Pacific's cooling fog. But he can appreciate that "It sort of looks like a Chinese landscape painting."

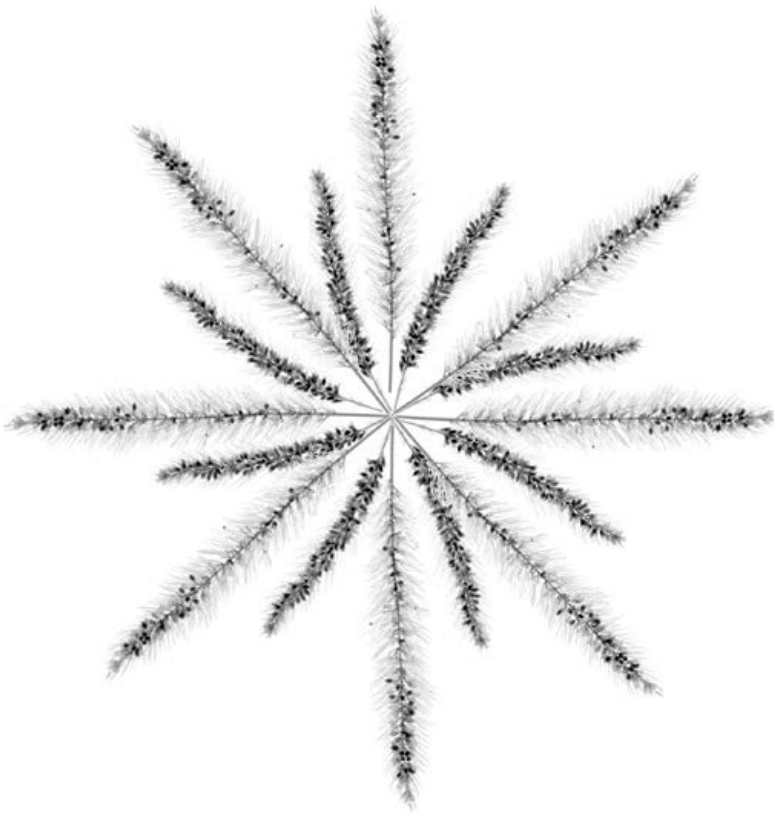
Landscape is ecosystem, and Kenmore wants to show farmers, policymakers, and their constituents that to make a healthy, lasting farm landscape depends not simply on a high-yielding new crop variety, but on what it interacts with, the system's other species, minerals, water, and gases, above and below the earth's surface. The FAO is the leader among UN organizations promoting 2015 as the International Year of Soils. "You have to conserve, you have to preserve it, to have any kind of security," Kenmore said. Better soil management and better cropping can make for more secure and sustainable income and better nutrition for farm families. "All this depends on conserving and restoring better ecosystems. It's not all about getting them better seed."

At the Prairie Festival, as presenter of the Strachan Donnelley Lecture on Conservation and Restoration, Kenmore will argue that talk toward this often has been hijacked, to simply promote products at the behest of supermarkets. But recent political change gives greater power to public voice. He will urge listeners to push for both funding and explicit US support of better farm management through programs like the FAO field schools. "The UN is where these kinds of discussions are held, and where policy can be thrashed out," he said.

Prairie Festival

The previous story tells of Peter Kenmore, who worked with small-scale farmers and will urge political action for them when he speaks at The Land Institute's Prairie Festival September 25-27. Mary Evelyn Tucker, co-director of the Forum on Religion and Ecology at Yale University, plans for her talk "Why the Papal Encyclical Matters for Our Common Home." John Cobb Jr., ecological theologian and philosopher, proposes, "Changing Our Worldview: Why it

Matters." Environmental studies scholar Angus Wright will explore what people in the past have done for access to good soil, and what they might do in the future. Other scheduled speakers are Ricardo Salvador, director of the Food and Environment Program for the Union of Concerned Scientists; and Land Institute President Wes Jackson. Also planned are music and art (see below). For more information, or to register, click the Events tab at landinstitute.org or call 785-823-5376.



"Prairie II," a collage of X-ray images by Dornith Doherty. The Texas photographer will show September 25-27 at The Land Institute's Prairie Festival. She has explored the world's botanical backup system kept in case of political strife or climate change: seed banks. The banks use X-rays to assess viability of stored seeds. The artist said the X-rays also play to thinking philosophically and ecologically about gene banking, and to questions about life and time.

The last sunshine farmer

JOHN CURTIS



My grandfather, Alvin John Curtis, was born in Bethel Township of McDonough County, west central Illinois, in 1915. When he was a boy, cars were rare, the combustion engine was

a new and unusual thing, and most people still traveled by foot or by carriage or on horseback.

When my grandpa was young, his neighborhood was a great patchwork quilt of small fields, hedgerows, and farmsteads. The small towns and communities of McDonough County were lively, vibrant places full of local people and local commerce. On Saturdays, neighboring farmers and their families came to town to get their hair cut, to buy supplies, and to socialize. On Sundays, the churches were full of local people who gathered to hear the word of God and to meet with their friends and neighbors. It was a good time to grow up in this area. In some ways, perhaps, it was the best time.

When my grandfather started farming on his own in the 1930's, many farms were still almost entirely powered by the sun. This fact seems remarkable today, given the fossil fuel dependence of modern agricultural operations and the industrial food system as a whole. In those days, many farmers still plowed, cultivated and harvested with teams of horses or mules, the traditional "engines" of the small farm. The horses were

fed oats, grass, hay, and other crops raised on site, as were the cows, pigs, chickens, and other animal members of the farm. The manure from these animals was carefully collected and returned to the soil to improve the fertility for future crops, creating an elegant closed loop that helped to make Grandpa's farm self-sufficient.

Corn is king in this part of the world, and that was also true in Grandpa's day. Until Grandpa reached his mid-30's, the planting, cultivating, harvesting, storing, and feeding of corn was all done by hand and with horses. I am amazed by the idea of harvesting, shucking, loading, and unloading 80 acres or more of corn by hand. Grandpa would buy specialized gloves for corn harvesting. Each glove had two thumbs. Grandpa would wear through one side of the gloves before dinner – what we now call lunch – and then wear the "back" side of the gloves in the afternoon and evening. By the end of the day, the gloves were worn clean through and he'd have to start with a new pair of gloves the next morning.

Imagine, if you can, hand harvesting and shucking corn from before sunrise to after sunset every day for weeks at a time. Now imagine doing that in December and into January with the temperature below freezing. And of course there were all of the chores that needed to be done both before and after that long day. After the wagon was unloaded, the horses had to be fed and cared for, all of the cows had to be milked, and the other livestock looked after.

Grandpa defined himself by his work. He was a man known for his work ethic or “working like a man,” as he might have put it. Manual labor was a central part of Grandpa’s workday most of his life, and he was a physically powerful man well into his 70’s. There was no end to the tasks that Grandpa took on in caring for his stock, building and repairing fence and buildings, maintaining equipment.

My grandfather was a caretaker and a steward. Grandpa had a deep connection to his farm that I think might be hard for people to understand today. His farm was a lot more to him than a piece of land to make money on. He was always looking for ways to improve it. Over the years, he took all of the erodible land out of production, and had several ponds and dams built to protect against heavy rain.



Alvin Curtis always spent part of the day on the land that had been a part of his life since earliest memory.

He and Grandma put a lot of thought and energy into maintaining the perennials around the house, many of them planted by my great-grandmother. For many years after he’d given up most of the farm work, Grandpa planted thousands of trees in different plots around the farm. As long as he was able, Grandpa always spent part of the day out on the landscape that had been a part of his life since his earliest memories.

I think Grandpa’s farm work shaped him as much as he shaped his farm. As was the way with good farmers who grew up working with stock, Grandpa was patient, gentle, and humble. He was a problem solver. He was honest and hard working. He had a great sense of humor and he laughed easily. As far as I know, Grandpa never drank alcohol, or smoked or swore – unless you count, “What the Sam Hill!” He was reluctant to criticize, and quick to be generous. He was fair and honest in his dealing with others. Grandpa always cleaned his plate.

My grandfather would not have been considered unusual in his time. He was a farmer just like most of the men of his generation were. But men with his work ethic, his character, and his dedication to his place, his family, and his neighborhood are rare today, and I can’t help but feel that those of us who remain hardly measure up to Grandpa’s “greatest” generation. Sometimes I wonder whether that could ever change.

If it could, I think it would need to begin with the resettling of our increasingly industrialized and abandoned rural areas. People will need to return to the countryside with the intention of digging in and developing long-term, mutually beneficial working relationships with the landscapes that they inhabit. We will need to embrace physical labor as a necessary and important part of our lives and, especially, re-establish direct connections between the ground that

surrounds us and our kitchens. We will all need to read more Wendell Berry.

Grandpa died last July, just short of his 99th birthday. Afterward, I spent a lot of time thinking about the man that I had observed and loved for four decades, and the stories he told me about his life. A few days after he died, the newspaper obituary reported his age, his occupation, where he lived, which of his family members “preceded him,” and which “survived.” To me, this account seemed an empty and impoverished picture of a man who lived so long and so well, and who represented what was best about our people and our part of the world. I wanted to think about his life and death more personally and more visually.

I don’t know what happens when we die. But I can imagine what it might have been like for Grandpa when he died that Sunday morning last July. I imagine Grandpa’s release and the sudden freedom from the decrepit bag of bones that was once his strong and able body. He feels a lightness and a sense of relief and contentment. For the first time in decades, Grandpa’s vision, his hearing, and all of his senses are crystal clear.

He finds himself on the familiar landscape of his farm, but it is the farm of his childhood. He is a 6-year-old running down a familiar footpath, carrying a clay jug of water from the house out to his father, John Luther, and his older brothers, Vilas and Damon, as they cut and bundle the wheat under a blazing sun. As he squeezes through a gap in the fencerow he notices that the world seems alive with the sounds from his and the other farms in the neighborhood. He hears and recognizes the voices of people talking, shouting, laughing, and calling, and then the sounds of cows, pigs, horses, chickens, and other animals both domestic and wild. There are no sounds of motors.

Grandpa returns to the house with the empty jug, ducks under the clothes drying on the line, and goes into the summer kitchen. He peeks through the doorway and sees his mother and his Aunt Hattie working with his oldest sister, Nelly, to get dinner ready. His younger sisters are also helping. Mildred is on the porch setting out the plates. Helen is making last-minute trips to the garden to bring in carrots, green onions, and the first ripe tomatoes. Florence is putting the finishing touches on blackberry pies. The whole house is filled with the comforting sounds of the Curtis and Davidson women visiting in Swedish and English as they prepare to feed the men. Grandpa’s stomach rumbles as he takes in the smell of chicken, onions, and potatoes frying.

The scene shifts and Grandpa is now a man in his early 30’s. The sun is just peeking over the horizon, and the roosters are crowing all over the neighborhood as Grandpa walks through the outbuildings of his first farm in Hire Township. He scratches the backs of his dairy cows, speaking to them softly and soothingly, and sees that their bags are tight with milk. The barn cats take notice of his visit, and the kittens meow in excitement, anticipating a squirt of milk expertly directed at their mouths.

Grandpa moves on to the horses. They are like old friends. This is a good team and it is his last. He knows that he and Grandma will be buying a tractor soon. Agriculture is changing, and Grandpa isn’t going to be left behind.

Nevertheless, he is proud of his beautiful horses. He raised them from colts and trained them as a team. These horses are an extension of him when they are out together in the field plowing, harrowing, seeding, and cultivating. They have kept him company on those cold evenings in January as he works his way down the quarter-mile rows

pulling ears off the dry corn stalks. All of his life, Grandpa has treated all of his animals with care and affection, but the connection to his horses is deep.

Grandpa heads out toward the clover pasture where the pigs have recently been moved, and is joined by his dog, Tippy. Grandpa smiles big, and Tippy, tail wagging furiously, approaches Grandpa to have his ears rubbed. It's a joyful reunion. Grandpa owned, raised and befriended many dogs in his lifetime, but only a handful of them were good help. Tippy was the best of the lot. The two of them take one last look over the hogs together, Grandpa scratching the backs of the old sows with a stick as they grunt appreciatively, Tippy checking the fences and moving quickly to correct any pigs that seem out of place. On the way back toward the house, Tippy and Grandpa look over the fields. The corn is tasseling and looks very good, probably some of the best in the county. This cropland is good, black prairie dirt; but Grandpa feels the dissatisfaction of not quite feeling at home here. He still longs for the old home place of his childhood.

The scene shifts again and Grandpa is in his mid-50's. He is back at the old farmstead after purchasing it from his siblings. He has just sold the last of his pigs, and with the proceeds will pay off the farm. He and Grandma have worked hard for 35 years, even farming two farms for a while, living thriftily, and putting every extra nickel toward the mortgage. Grandpa feels an overwhelming sense of relief and accomplishment.

Finally, Grandpa is back in the present. It is Sunday morning, July 13, 2014, and the sun is already high. It's time to make one final journey through and over the farm that he has shaped and that has helped shape him most of his life. Grandpa knows this landscape more intimately than he does his

own body, and passes through it as silently as a shadow. It's cool for July, and the corn is green and thick. Grandpa looks over the dry dams and ponds and the marginal cropland that he has reforested. He is satisfied with the work completed, but feels the tug of the jobs not finished, the projects unrealized, the parts of the land that need attention. He knows he has to let those go. It is for the next generation to decide how it cares, or does not care, for the land.

He passes through the gate into the big pasture that has long since become woods. The morels are long gone, and the mayapple umbrellas have largely disappeared under honeysuckle and roses. Grandpa sees the last of the wild strawberries, and notices that the first blackberries are ripe. Here and there he sees signs of the wild animals that he and his family have hunted, fished and trapped for generations: rabbits, fox and gray squirrels, possum, red and gray foxes, raccoons, channel cat, sunfish, bass and bullheads, snapping turtles, bullfrogs, geese, ducks, turkeys, and deer. Grandpa pauses for a moment at the sound of quail calling to each other in the distance. It gives him a sense of hope.

Finally, Grandpa arrives at the opening at the top of the bluff that overlooks the creek and the bottoms. He basks a moment in the warmth of the bright sunlight, breathes out and settles in himself. He is ready now. He releases his hold and his demands on his landscape, his loved ones, and his old life. He looks up, and then he's gone. He goes to join those who have preceded him. Those who remain are diminished by his absence. We are left to do the best we can, without him.

The last conversation I had with Grandpa was when I stopped for a few minutes on my way back from visiting his farm a week or so before his death. Grandpa

was unusually lucid that day, and we talked for “quite a little while,” as they say in the neighborhood. What I remember most is Grandpa saying, “Well, I guess I’m never going to get out of here,” meaning the dark, sterile room in the health care unit of his retirement home. I responded, “No, Grandpa, I don’t think so. But what would you do if you could leave?”

Grandpa paused for a minute, and he answered with one word: “Farm.”

My grandfather, Alvin John Curtis lived

a long life, a full life, a good life, a strong and clean life. I challenge you to think of a better one. He fulfilled his moral obligations to the land, to his farm, to the animals that he has cared for and worked with, to his family and to his community.

It is left to the rest of us to live up to his example.

The writer was a Land Institute intern in 1995. He runs Barefoot Gardens CSA (community supported agriculture) and teaches near Macomb, Illinois.

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Harvesting perennial wheat is Land Institute summer worker Jeffrey Michel, a student at University of Kansas. Might such schools – and high schools, grade schools, and preschools – be brought to overhaul education so people see themselves as just one, dependent part of a vast connection called the ecosphere? For a discussion, see page 4. Scott Seirer photo.